Wilmot Evolution Review

1. Define species- group of organisms that can interbreed and produce fertile offspring

2. What was Jean Baptiste de Lamark’s contribution to evolution? Theory of Acquired Inheritance. Thought that acquired traits could be passed on to offspring. Proven False.
   a. What animal at the zoo provides a perfect example of his theory (this theory was found to be incorrect) Giraffe

3. The deeper the fossil is found inside the Earth, the older it is.

4. Charles Darwin:
   a. Sailed on the ship HMS Beagle
   b. What observation did Darwin notice between the finches on Ecuador (mainland South America) and those on the different islands of the Galapagos? There was much VARIATION Between them, depending on the food available. The common ancestor must have been a mainland species.

5. Four Components of Natural Selection:
   a. Overproduction of Offspring
   b. Variation
   c. Adaptation
   d. Descent With Modification (Survival of the fittest)

6. Using the four components above, match the principle of natural selection with the correct definition:
   a. Overproduction of Offspring- Producing many offspring, some of which may not survive.
   b. Variation- Heritable differences that make an individual unique.
   c. Adaptation- An advantageous trait; one well suited for the environment.
   d. Descent With Modification- A heritable, advantageous trait becoming more common in a population.

7. Circle one: Natural Selection acts on existing traits or Natural selection works on DNA

8. Sexual Selection Definition- a trait that increases mating success
   a. What is the difference between Intra-sexual and Intersexual selection? Intrasexual is competition among the males and intra is males showing off their “sexy traits” (colors)
   b. Why are the females so picky about their male mates? The higher cost of reproduction in females

9. For the following choose either VARIATION or ADAPTATION
   a. V The physical difference between organisms in a population
   b. A A feature that allows an organism to better survive in its environment
   c. A A tortoise population lives in an area with tall grass. These tortoises have longer necks than tortoises that live in other areas. Having a long neck is an example of this
   d. V One fish in a population has slightly darker scales than its relatives. The difference in color of scales is an example of this.
10. What are the five factors that can lead to evolution?
   a. **Natural Selection**
   b. **Sexual Selection**
   c. **Mutations**
   d. **Gene Flow**
   e. **Genetic Drift**

11. Match the type of evidence to its description

<table>
<thead>
<tr>
<th>Evidence Type</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fossils</td>
<td>Different organisms share similar structures that have very different functions, or have remnants of structures/organs that had functions in the past. Fossil organisms found in bottom (older) layers are more primitive than those found in the upper (newer) layers; often times, these extinct fossils resemble modern life.</td>
</tr>
<tr>
<td>Geography</td>
<td>Different habitats favor different traits and can establish separate populations that have a common ancestor.</td>
</tr>
<tr>
<td>Embryology</td>
<td>During the early stages of life, embryos of very different organisms appear to be very similar. As they continue to develop, they become increasingly different.</td>
</tr>
<tr>
<td>Anatomy</td>
<td>Different organisms share similar structures that have very different functions, or have remnants of structures/organs that had functions in the past.</td>
</tr>
<tr>
<td>Biochemical</td>
<td>In DNA sequencing, the more closely related two organisms are, the more similar their DNA.</td>
</tr>
</tbody>
</table>

12. Some structures perform similar functions; however, they are not evidence of a common ancestor. These are called **Analogous** structures. (hint: wing of a bat and a fly would be an example)

13. Fill in the blanks with the words below:

   **Speciation** **Environment** **Gene Flow** **Mutations** **Species** **Mate** **Genetic Drift**

   Two populations are said to be isolated if there is no longer any **Gene Flow** between them. Over generations, the members of isolated populations may become more and more different. Isolated populations may become genetically different, as those that are better adapted to the new **environment** survive and reproduce. Random processes such as mutation and **genetic drift** can also effect evolution. When members of two isolated populations can no longer successfully **mate**, the populations are said to be reproductively isolated. Reproductive isolation is the final step prior to speciation, which is the evolution of a new **species**.

14. Describe convergent evolution using an example. Would structures in this example be homologous or analogous?

   **Whales (mammals) and sharks (fish) are not closely related; however, they have similar body plans and both have fins. Their fins would be ANALOGOUS structures because while they are both used to swim, they are actually very different.**

15. Describe divergent evolution using an example. Would structures in this example be homologous or analogous?

   **The kit fox and the red fox share a common ancestor, but are different species living in different environments. The kit fox has evolved to stay cool in the desert, and the red fox warm—this is homologous structures (similar coats, but perform different functions).**
16. In the table below, fill in the spaces about the two ways in which species can co-evolve. (hint- Google the two terms and you will find many examples)

<table>
<thead>
<tr>
<th>Type of Coevolution</th>
<th>How it Works</th>
<th>Example</th>
</tr>
</thead>
<tbody>
<tr>
<td>Beneficial Relationship</td>
<td>Two or more organisms live in a way where they benefit each other and evolve in response to changes in each other</td>
<td>Insects and flowers (insects help the flowers reproduce, the flowers provide food), or hummingbird beaks &amp; flowers</td>
</tr>
<tr>
<td>Evolutionary Arms Race</td>
<td>Two or more organisms evolve in response to changes in each other; however, this is in a competitive sense- in order to survive</td>
<td>Bacteria and doctors/medication (antibiotics). The best adapted bacteria can survive in the presence of the antibiotic, so Drs have to create stronger meds</td>
</tr>
</tbody>
</table>

Tortoises eat plants. On one island plants grow very close to the ground. Which island do you think this is?

- **Isabela Island**
- **Hood Island**

**EXPLAIN** your answer. Why did you choose the island you did?

**Neck Adapted to eat plants low to the ground**

Which island do you think has sparse vegetation that is hard to reach?

- **Pinta Island**
- **Hood Island**

What would you predict the vegetation and rainfall are like on Pinta Island? **Medium Sized Vegetation**

**MULTIPLE CHOICE**: Circle the letter of the ONE BEST answer that completes the statement.

Structures that have different mature forms, but develop from the same embryonic structure are called ________________ structures.

- A. Darwinian
- B. Lamarckian
- C. homologous
- D. fossils

Because of its similarities to artificial selection, Darwin referred to the "survival of the fittest" as ________________.

- A. use it or lose it
- B. natural selection
- C. homologous structures
- D. struggle for existence
The idea that each living species has descended with changes from other species over time is called _________.

- A. descent with modification
- B. struggle for existence
- C. artificial selection
- D. acquired traits

The natural differences between individuals of a species are referred to as __________________.

- A. fitness
- B. natural selection
- C. adaptations
- D. natural variation

When farmers select the largest hogs, the fastest horses, or the cows that produce the most milk for breeding it is called ____________.

- A. natural selection
- B. artificial selection
- C. survival of the fittest
- D. homologous variation

An inherited characteristic that increases an organism's ability to survive and reproduce in its specific environment is called a(n) ________________.

- A. homologous structure
- B. vestigial organ
- C. adaptation
- D. speciation

A human appendix, whale hipbones, and a skink's legs are examples of _________________.

- A. homologous structures
- B. embryonic mates
- C. vestigial organs

The bones in the diagram at the left are examples of ________________.

- A. homologous structures
- B. embryonic mates
- C. vestigial organs

Which of the following best describes how DARWIN would explain giraffes with long necks?

- A. Long-necked giraffes eat more grass than short necked giraffes so their necks grow longer.
- B. Natural variation in the population produces some longer and some shorter-necked giraffes and longer necked giraffes can reach food more easily and survive to pass on their genes.
- C. Some giraffes have acquired longer necks by stretching to reach food and passed that trait on.
- D. Giraffes just started out with long necks and haven't changed.

Competition for food, space, and other resources among members of a species is called ________________

- A. common descent
- B. artificial selection
- C. survival of the fittest
- D. struggle for existence
The ability of an individual to survive and reproduce in a specific environment is called _______________
A. fitness  
B. common descent  
C. **survival of the fittest**  
D. struggle for existence

**MATCH THE PATTERN OF MACROEVOLUTION WITH ITS DESCRIPTION**
You can use them more than once!

D  Whales, sharks, and penguins all have streamlined bodies and appendages for moving in water even though they belong in different classes of animal classes (mammals, birds, fish)  

A  Hummingbirds have a beak just the right length to reach the nectar in a cardinal flower and as they feed their foreheads bump into the pollen structure. Cardinal flowers are red which hummingbirds can see but bees can't, and their pollen structure is at just the right height for the hummingbird to pick up pollen as it feeds.

E  Horse evolution shows long stable periods of little evolution interrupted by brief periods of rapid change

B  The Galápagos finches evolved through natural selection from a common ancestor into a wide variety of different looking species with different kinds of beaks

C  At the end of the Cretaceous period an asteroid hit the Earth causing the loss of many species including the dinosaurs

B  Ostriches are native to the savannahs of Africa, while penguins live in the polar regions. Although ostriches and penguins are closely-related, they look very different.

D  Ostriches and giraffes are both native to the savannahs of Africa. They share the same characteristic of a very long neck.

B  Also called divergent evolution

**Allele Frequencies - Calculate the allele frequency for both the dominant and recessive allele.**

Two alleles (Brown, B and White, b) exist for mouse fur color.

290 Mice are homozygous dominant (BB), 425 are hybrid (Bb), and 270 are homozygous (bb). Calculate the allele frequencies.

\[ \begin{align*} 
B &= \frac{290}{290 + 425 + 270} = 0.51 \\
\text{b} &= \frac{425 + 270}{290 + 425 + 270} = 0.49 
\end{align*} \]

**Allele Frequencies in a Population will stay fairly stable Assuming:**

a) Large Population Size  
b) No Mutations Occurs  
c) No Migration Occurs  
d) All members of the population breed, and mating is random  
e) Natural Selection does not occur  

**No Evolution is Occurring!**
Microevolution of a species - Changes of allele frequency over time within a population (5 Causes)

1. **Genetic Drift** - the change in the gene pool of a small population due to chance
2. **Natural Selection** - Survival of the fittest - Causes ADAPTATIONS in Populations
3. **Gene Flow** - is genetic exchange due to the migration of fertile individuals or gametes between populations
4. **Mutations** - Mutations can be transmitted in gametes to offspring
5. **Sexual Selection** - Mates are chosen on the basis of the best traits

**LABEL THE THREE GRAPHS BELOW SHOWING PATTERNS OF SELECTION:**

- **A** Diversifying Selection
- **B** Directional Selection
- **C** Stabilizing Selection

**MATCH THE GRAPH ABOVE WITH THE POPULATION DESCRIPTION:**

**B** In which of these is the fitness of individuals at one end of the normal distribution curve higher than that of individuals in the middle or at the other end of the curve

**C** In which of these is the fitness of individuals in the middle higher than that of individuals at the extreme ends

**A** In which of these is the fitness of individuals at the extreme ends higher than that of individuals in the middle

**C** Human babies born smaller than average are likely to be less healthy and less likely to survive. Larger than average babies are likely to have difficulty being born. The fitness of these larger or smaller weight babies is lower than average-sized babies so human babies tend to born of average size.

**B** Birds with bigger, thicker beaks can feed more easily on larger, harder seeds. A food shortage causes the supply of small and medium seeds to run low, leaving only larger seeds. Birds with bigger beaks show greater fitness than birds with medium or small beaks. Over time more birds with bigger beaks survive and reproduce.

**B** The orange and black pattern of a Monarch butterfly serves as a warning to sharp-eyed birds that the Monarch is poisonous to eat and tastes bad. Individuals with the brightest color pattern were more likely to warn off birds and survive to reproduce than those with a dull or medium color pattern. Over time and many generations, the Monarch population became more brightly-colored.

**C** In birds, feather color among males is more likely to attract a mate, but also more likely to attract a predator. Over time and many generations, the highest frequency color is for males with medium colors, while males with very dull colors and males with very bright colors became increasingly rare.

**A** A population of birds lives in an area where plants with medium sized seeds are wiped out by a fungal infection. Birds with unusually large or small beaks would have higher fitness than those with medium sized beaks. Over time the population splits into two subgroups; one that eats small seeds and one that eats large seeds.